

# PRELIMINARY RESULT FOR LONGITUDE OF BLOEM-FONTEIN FROM AN OCCULTATION.

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I HAVE long ago, and often, tried to get surveyors and other competent observers to observe occultations of fixed stars by the Moon in remote parts of South Africa in order to determine the longitudes of their positions, but I am sorry to say on the whole without success—on the one hand, when the telegraph wire reaches a station, a good observation of local time with an exchange of time signals to the Observatory fixes its longitude far more securely and easily than any other observations can do; and on the other, when a man has been travelling or working all day he does not feel much inclined (even if he can get at his instruments) to make the necessary observations for local time which are required to make any use of a non-frequent phenomenon, which as a rule occurs at inconvenient hours of the night.

However, towards the end of 1891, I asked several gentlemen who, I knew, were capable of making the observations, to observe the occultation of a 5th magnitude star on Dec. 6—a disappearance at the dark limb of the Moon. Unfortunately a completely clouded night prevented my observing it here: the only place where it was seen was at Bloemfontein, by R. E. Brounger, Esq., and it is the result of his observation that I lay before you to-night, in the hope that others will be induced to follow his example.

For determination of local time Mr. Brounger observed three altitudes, to the East, of  $\beta$  Orionis and three, to the West, of  $\beta$  Aquarii. At the time of observation the stars were sufficiently near the prime vertical to make any error in the assumed latitude practically inappreciable. His results for local time were as follows:

| Star.           | Division. | Correction to watch.                     | Star.           | Division. | Correction to watch.                     |
|-----------------|-----------|--|-----------------|-----------|--|
| $\beta$ Orionis | East      | <sup>m</sup><br><sup>s</sup><br>+1 49.54 | $\beta$ Aquarii | West      | <sup>m</sup><br><sup>s</sup><br>+1 57.90 |
| ”               | ”         | +1 48.53                                 | ”               | ”         | +1 57.15                                 |
| ”               | ”         | +1 48.81                                 | ”               | ”         | +1 57.79                                 |
| Mean            |           | +1 48.96                                 | Mean            |           | +1 57.61                                 |

$$\text{Mean of East and West} = +1^{\text{m}} 53.3^{\text{s}}$$

The discordance between the East and West observations, is easily explained by a small error in the adjustment of the theodolite: but the mean of the East and West results should be nearly free from the effects of this error.

The disappearance of the star was noted at  $8^{\text{h}} 9^{\text{m}} 41^{\text{s}}$  by the watch, or at  $8^{\text{h}} 11^{\text{m}} 34^{\text{s}} 3$  local mean time. Assuming the tabular quantities for the moon's place given in the Nautical Almanac and an approximate longitude of Bloemfontein equal to  $-1^{\text{h}} 44^{\text{m}} 53^{\text{s}}$  from Greenwich, I get the equation.

$$\Delta l = -0.64 - 2.54\Delta\alpha + 2.65\Delta\delta - \Delta t$$

Where  $\Delta l$  = correction to assumed longitude in seconds of time

|                  |   |   |              |   |      |
|------------------|---|---|--------------|---|------|
| $\Delta\alpha$ = | „ | „ | R.A. of Moon | „ | arc  |
| $\Delta\delta$ = | „ | „ | Dec. „       | „ | „    |
| $\Delta t$ =     | „ | „ | local time   | „ | time |

The deduced correction, therefore, to the assumed longitude is very small, if the moon's place as given in the Nautical Almanac is fairly correct. On this point however I have as yet no control. As I said before, it was a cloudy night at the Cape: an observation here of the same occultation would have made the result differential, a very different thing to an absolute determination. Possibly when the observations of the moon made at other observatories are published I may find an observation on this date which will give me the means of determining the values of  $\Delta\alpha$  and  $\Delta\delta$ , and of arriving at a more definite result. But I do not wish to lay any stress on this. Before long a very accurate longitude of Bloemfontein will without doubt be determined by telegraphic signals with the Cape Observatory: but I do want to lay stress on the accuracy that can be secured in remote places by these observations compared to the rough results obtained by travellers trusting to the rates of a pocket chronometer over long periods. All that is wanted is a watch that will keep going fairly well for an hour, an intelligent observer and a fine night and a result can be relied on for longitude to a mile or two